EFFECT OF INCOME DIVERSIFICATION STRATEGIES ON SMALLHOLDER CASSAVA FARMERS' HOUSEHOLD FOOD SECURITY IN SOUTHWEST, NIGERIA

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Abstract

Food insecurity remains a challenge in the developing regions of the world and in particular among rural folks whose main source of livelihood is from farming and thus time bound. The study through primary data from 120 cassava farming households examined how income diversification strategies could improve food security. Descriptive statistics, USDA food security scale and logit regression model were employed for the analysis. 42.5% were food secure while 57.5% were food insecure. 'Cassava income + agricultural incomes' (CA); 'Cassava income + non-agricultural incomes' (CN) and 'Cassava income + both agricultural and non-agricultural incomes' (CAN) were the diversification strategies identified. Income diversification strategies and increased farm size exerted significant positive influence on household food security. Promoting income diversification into other agricultural enterprises (beyond cassava production) and non-agricultural businesses is therefore vital to enhancing household food security. Efforts to transform cassava farmers into large scale commercial producers will also enhance food security substantially.

Key words: *agricultural income, livelihoods strategies, non-agricultural enterprises*

INTRODUCTION

Attainment of security in terms of food in most developing regions across the globe including Nigeria remains a concern at the center stage. About 70% of the population in Nigeria are agrarian in nature as it serves as a means of livelihood for a significant number of people particularly rural inhabitants who produce food through their engagement in various agricultural-related activities in a bid to ensure food security [18].

According to [21], food security refers to a condition in existence "when everyone at all times has unhindered physical, economic and social access to enough, safe and nutritious food that meets their dietary and food needs so as to live an active and healthy life either at the individual, household, national, regional and global levels." Food insecurity on the other hand implies a condition when human beings experience some difficulties in accessing food both physically and economically [6]. Despite several programs and interventions over the years in Nigeria to attain food security, the situation still persists as over 8.7 million people in Nigeria are still food insecure [25]. In addition, a recent situation report on food insecurity in Nigeria revealed an increasing trend in the prevalence of the situation as the percentage rose from 6.6% in 2014 to 21.4% in 2020 [22]. Also, various indicators of food insecurity like calorie deficiency, global hunger index and food consumption score further showed that food insecurity is a major challenge in Nigeria as these indices were far from the standard threshold. For instance, the 2021 Global Hunger Index ratings showed that from the 116 countries considered, Nigeria was in the 103rd position. Also, the global hunger index score of 28.3 showed that the hunger level in the land is alarming [9].

Poverty, seasonal and geographical fluctuations in the prices of local food production experienced in Nigeria as a result of staggering weather conditions on agricultural activities, low infrastructures and global fluctuations in the price of staple foods that are imported have been identified out of

several other factors as drivers food insecurity [24, 7].

Smallholder farmers as described by [8] refers to farmers whose productive potential spans from 0.1 to 4.99 hectares of land holdings. They are further characterized by subsistence production, restricted access to current and improved agricultural technologies and generally their scale of operations usually does not attract appreciable inputs, labour and capital investment.

[3] reported that over 80% of farmers that grow food items consumed in Nigerian households are smallholders and they constitute a major pillar in the Nigerian agricultural sector.

Smallholder farmers in Nigeria have limited access to credit facilities which reduces their productivity to a great extent and the likelihood of being food secured. They can run out of food materials especially during the post-harvest periods when income from farming activities dwindles and as such, they are economically and financially vulnerable. Non-involvement in other income-generating livelihood activities could impact negatively their welfare and hence the need for income diversification is salient. According to [11], income diversification refers to changing from one crop to a combination of food crops or even high-valued cash crops (crop diversification) or switching from agricultural-bound enterprises into non-agricultural-bound enterprises (non-farm diversification). Furthermore, income diversification among rural folks may be viewed as a dynamic adaptation process through which threats and opportunities are responded to among farmers and also the management of risk and the need to acquire extra income so as to secure their livelihoods and subsequently improve their living standards.

Due to the subsistence-oriented farming patterns in Nigerian agriculture, smallholder farmers are vulnerable to risk and poor market orientation. As Cassava crop is resilient to drought and offers many agribusiness opportunities, it is considered the strategic driver to attaining sustainable economic development, high income levels and reduce poverty [10].

In this context, income diversification implies a process of combining cassava farming with other income-generating activities (farming related or non-farming related) in other to improve their standard of living. In addition, smallholder farmers do not solely produce their households' food needs and other items, they also buy some needed food and non-food materials from the market especially during the off-season when prices of food items are at the peak. Focusing on cassava farmers is due to the peculiar characteristics of the crops in combating poverty in Nigeria as documented by [4] and [16].

The study will add to the existing literature on how income diversification could influence food security particularly among smallholder farmers. Objectives specifically measured are to describe the socio-economic characteristics of the respondents; determine the food security status of cassava farmers' households and examine the effect of income diversification on food security of the household.

MATERIALS AND METHODS

Area of Study
Smallholder farmers that were into cassava production in Odeda Local Government of Ogun State were the respondents for the study. Odeda is situated in the North-Central region of the state with boundaries with Abeokuta South, Obafemi-Owode and Abeokuta North local government areas in the South, East and West respectively. It is also bounded in the North by Oyo state. It is a tropical rainforest vegetation zone notably with rainfall for an average of seven months. The mean temperature is about $32^{\circ}C$ and relative humidity of about 95% [19]. It has a land area of 1,320 km^2 and an estimated population of 152,300 [13]. Farming is the major occupation of the inhabitants with specialization in crop production and few engagements in livestock farming.

Sampling procedure
Multistage sampling procedure was employed in selecting the cassava farmers interviewed.

In stage one purposive selection of five regions out of the 10 regions notably known for cassava cultivation was done. In stage two, random selection of four villages from each region was done to give a total of twenty villages. In the last stage, proportionate sampling to size was done from where data were collected from 120 cassava farmers through the use of a well-structured questionnaire.

Analytical technique

Descriptive statistics (frequencies, percentages and mean) and inferential statistics were used for the analysis. Socio-economic characteristics of farmers, classification of cassava farming households according to their food security status as well as choice of income diversification strategy were summarized using descriptive statistics. Food security status was estimated using the USDA approach and logit regression was employed to examine the effect of income diversification on food security.

Description of income diversification strategy by cassava farmers

The four categories of income diversification strategy are as follows.

(i)Cassava farm income only (C Strategy): These are group of farming households that depend only on income from cassava farming. They do not grow other crop alongside cassava nor get involved in other income generating activities other than cassava farming. Simply put, this group did not diversify their income source.

(ii)Cassava farm income and other agricultural sources (CA Strategy): Farmers in this category involve themselves in other income generating activities that is agriculture-related alongside cassava farming. Such agricultural activity could be growing other crops, livestock farming, fish farming, earning income (wage) from other commercial or private farms.

(iii)Cassava farm income and other non-agricultural sources (CN Strategy): These farmers in addition to their cassava farming involved themselves in other income generating enterprises that is not relate to agriculture such as non-agricultural self-employment of any sort, managing a shop, trading and income earned from artisan related activities.

(iv)Cassava farm, agricultural and non-agricultural income sources (CAN Strategy): Cassava farmers in this group earn incomes simultaneously from all the mentioned sources above. They engage in both agricultural and non-agricultural related activities.

Estimation of cassava farmers' household food security status

From literature, it is an established fact that income and economic access to food are directly proportional to one another. Considering the above, the study focused on the access component of food security since the study is on income diversification. Food security status of cassava farming households was examined by employing the USDA (United States Department of Agriculture) Food Security Approach. Households are classified into four classes in line with their food security status which was generated from the USDA survey tool [15]. Data were collected by employing an 18-item household food security questionnaire. Determination of household food security status was derived following the respondents' responses (yes/no) to a list of questions regarding their actions when there are difficulties in meeting the food needs of the household members [5]. Each of the question inquires if the action took place at any time in the household during the last one month [10] and was due to lack of money or food but not voluntary fasting or dieting. The total number of positive responses (yes) received from the list of questions in each household was used to generate a score. In households with children, the score ranges from 0 to 18 and 0 to 10 in households without children. A major assumption in this measurement model is that households with greater food insecurity score demonstrate a higher likelihood of a "yes" response to each of the asked questions while more food secured households will demonstrate a higher likelihood in responding negatively to each of the asked questions. The probability of a positive response to each of the questions asked is statistically independent for all households with similar level of food

insecurity. In line with this, the households were grouped into four classes, namely food secure (FS), food insecure without hunger (FIWH), food insecure with moderate hunger (FIWMH) and food insecure with severe hunger (FIWSH).

Table 1. Food security category according to USDA

Food security status	Household with children (18 questions)
Food secure (FS)	Between 0 and 2 positive answers
Food insecure without hunger (FIWH)	Between 3 and 7 positive answers
Food insecure with moderate hunger (FIWMH)	Between 8 and 12 positive answers
Food insecure with severe hunger (FIWSH)	Between 13 and 18 positive answers

Source: United States Department of Agriculture (USDA), 2016 [24].

(i)Food secure households: These households consistently access food without any problem, barriers or anxiety. These groups were allotted the value of 1 on the food security scale.

(ii)Food insecure without hunger: Accessing adequate food in these households may be challenging at times, but the quality, quantity and variety of their food consumption did not decreased. Adjustments is shown in their daily food management. These were assigned the value of 2 on the food security scale.

(iii)Food insecure with moderate hunger: Food intake quantity and normal eating patterns were not considerably disrupted among these groups of households but diet quality, variety and desirability are considerably disrupted. These were allotted the value of 3 on the food security scale.

(iv)Food insecure with severe hunger: For this group, there are reduction in food intake owing to financial constraints and as a result, eating patterns of few household members will be disrupted. They were assigned a value of 4.

Estimating the effect of cassava farmers' income diversification on household food security

Logit regression was employed to examine the effect of income diversification and other factors associated with a household's likelihood of being food secured. The dependent variable is dichotomous in nature because it is a binary choice model. The estimated probabilities lie between the range of 0 and 1 in the logit regression model. Also, they do not exhibit linear relationship with the explanatory (independent variables) but rather depend on the cumulative logistic distribution function expressed as:

$$P_i = \text{Prob}\{Y = 1/X\} = 1/1+e^{-z} \quad ....(1)$$

For easy interpretation,

$$z_i = \alpha + \beta_1 x_1 + \beta_2 x_2 .... \beta_n x_n. ....(2)$$

Equation 2 can be stated in its odd ratio form as:
The log of odds ratio or the logit =

$$\text{Ln}\left(\frac{Pi}{1-Pi}\right) = \alpha + \beta_1 x_1 + \beta_2 x_2 .... \beta_n x_n ....(3)$$

where:
Pi = Probability of being food-secured.
β_i = parameters of the independent variables,
i = indexes of the households observations.
To get the value of z_i, the probability of observing the sample among the respondents must be formed through the introduction of a dichotomous dependent variable Y_i such that Y is equal to 1 if the household is food secure and 0 if otherwise. The model was estimated using the maximum likelihood estimation (MLE) technique. The explicit form of the model is expressed as:
Y = Household food security status (food secure = 1; 0 otherwise)
X_1 = Age of cassava farmer (years)
X_2 = Sex of cassava farmer (male =1; 0 otherwise)
X_3 = Household size (number of individuals)
X_4 = Cassava farm size in hectares (ha)
X_5 = Cassava yield (kg/ha)
X_6 = Income saved (naira)
X_7 = Cassava farm and other agricultural income sources, CA (CA= 1, otherwise 0)

X_8 = Cassava farm and other non-agricultural income sources, CN (CN= 1, otherwise 0)
X_9 = Cassava farm, other agricultural and non-agricultural income sources, CAN (CAN= 1, otherwise 0)
Note that households that fell into groups 1 and 2 above were collapsed into one and were regarded as food secure households while those that fell into the third and fourth were also merged into one group and were regarded as food insecure households**.**

The *A priori* expectations are for the variables to be positively related to food security except for age and household size which may be otherwise.

RESULTS AND DISCUSSIONS

Socio-economic characteristics of smallholder cassava farmers
The socio-economic characteristics of the cassava farming households are displayed on

Table 2. Majority (96.7%) of the cassava farmers were male whereas just few (3.3%) were female. This means that men are more involved in agriculture and specifically, cassava farming possibly as a result of the arduous nature of the work as female will be underprivileged in this regard. Most (43.3%) of the cassava farmers were 50 years old and above, 23.3% were in the 30-39 age group. 20.8% fell into 40-49 age group while those less than 30 years of age constituted the least (12.5%). An average cassava farmer in the study area was 46.03 years. This suggests that majority of the farmers in the study area are still in their productive and active capacity, thus, could still actively engage in diverse income generating enterprises. This may possibly increase their chances of being food secured. Distribution of the respondents by marital status indicated that 13.3% were single and majority (86.7%) were married.

Table 2. Socio-economic characteristics of Cassava farmers

Personal characteristics	Frequency	Percentage	Mean
Sex			
Male	116	96.7	
Female	3	3.3	
Age (years)			
<30	15	12.5	
30-39	28	23.3	
40-49	25	20.8	
50 and above	52	43.3	46.03
Marital Status			
Single	16	13.3	
Married	104	86.7	
Level of Education			
Primary	60	50.0	
Secondary	56	46.7	
Tertiary	4	3.3	
Household Size			
1-4	87	72.5	
5-8	29	24.2	
9-12	4	3.3	4
Farm Size (hectares)			
1-4	99	82.5	
4.1 and above	21	17.5	2.8
Cassava Yield (kg/ha)			
1,000-5,000	90	75.0	
5,001-10,000	9	7.5	
10,001 and above	21	17.5	6,358.33

Source: Computed from Field Survey, 2021.

Furthermore, in terms of education, half (50.0%) of the farmers had primary school

education, 46.7% had secondary education while very few (3.3%) had tertiary education

level. Educational attainment could determine the level of opportunities available to improve income diversification strategies, improve food security and consequently reduce poverty level among the farmers. Majority (72.5%) of the sampled households had between 1- 4 persons in their households with very few (3.3%) had large household size of between 9 – 12 individuals in their households. 24.2% had between 5 – 8 individuals in their households. This distribution may not necessarily put pressure on household resources particularly food.

Majority (82.5%) of the farmers were small holder farmers who cultivate between 1-4 hectares of farmland while very few (17.5%) cultivate above 4 hectares of farmland. The mean farm size was 2.8 hectares. This suggested that the farmers are smallholder farmers. Yield from cassava showed that majority (75%) had between 1,000 and 5,000kg/ha, 7.5% had between 5,001 and 10,000kg/ha while just very few (17.5%) had yield above 10,000kg/ha.

Income diversification strategies among the cassava farmers

Distribution of cassava farmers according to diversification strategy employed is shown on Table 3. Cassava income in addition with agricultural income (CA) constituted the modal group. They represented 54.2% of the farmers interviewed. Furthermore, one-quarter (25.0%) of the cassava farmers (C) do not diversify at all and as such they rely only on income from cassava farming. Very few (12.5%) of the cassava farmers embrace income from non-agricultural sources in addition to income from cassava farming

(CN). The least represented category (8.3%) are cassava farmers that combine income sources from both agricultural and non-agricultural related activities (CAN). This low representation might be due to the tedious and strenuous nature of involving in several income generating activities almost at the same time despite the fact that it was highly rewarding financially as found out in the study.

Cassava income only (C strategy): Farmers in this category earned a mean income of ₦ 71,500 and the standard deviation was 21381.19 (Table 3). The incomes earned in this category ranged from a minimum of ₦ 40,000 to a maximum of ₦ 95,000.

Cassava income plus other agricultural income strategy (CA strategy): More than half of the cassava farmers (54.2%) who practiced the 'CA strategy' earned between ₦ 68,000 and ₦ 191,000 during the growing season. The mean income for this category was ₦126, 556.14 with a standard deviation of 35102.85.

Cassava income plus non-agricultural income strategy (CN strategy): Their mean income was ₦ 143,880 and the standard deviation was GHS 21486.08. The least earner in this strategy earned ₦ 115,000 for the season while the highest income realized was ₦189, 000.

Cassava income plus other agricultural plus non-agricultural income strategy (CAN): The mean seasonal income of farmers who employed the CAN strategy was ₦ 185,320. The least income realized for the season was ₦ 155,000 while the highest earner had ₦225,000 as income.

Table 3. Income diversification strategies and mean income earned in Naira

Income Strategies	Responses		Mean Income (Naira)			
	Freq	%	Mean	Std. Dev.	Min.	Max.
Cassava income only (C)	30	25.0	71,500.00	21381.99	40,000	95,000
Cassava and other agricultural income (CA)	65	54.2	126,556.14	35102.85	68,000	191,000
Cassava and non-agricultural income (CN)	15	12.5	143,880.00	21486.08	115,000	189,000
Cassava and agricultural and non-agricultural income (CAN)	10	8.3	185,320.00	22318.19	155,000	225,000

Source: Computed from Field Survey, 2021.

Estimation of food security status of cassava farming households

The food security status of the cassava farming households in the study area on Table

3 showed that 42.5% of the households are food secure, 6.7% are FIWH, 13.3% are FIWMH and 37.5% of the households are FIWSH. This implies that a large number (57.5%) of the households remain food insecure at different food insecurity levels. This implies that the problem of food insecurity exist among farming households particularly those in rural areas. This result agrees with earlier submission of [1] and [17] who reported that food insecurity situation is more pronounced among rural farming households than urban households.

Table 4. Food security status of cassava farming households

Food security status	Frequency	Percentage
Food secured (FS)	51	42.5
Food insecure without hunger (FIWH)	8	6.7
Food insecure with moderate hunger (FIWMH)	16	13.3
Food insecure with severe hunger (FIWSH)	45	37.5
Food secure households	59	49.2
Food insecure households	61	50.8
Total	120	100.0

Source: Computed from Field Survey, 2021.

Effect of income diversification on food security among smallholder cassava farming households

Examining the relationship between income diversification strategies and household food security among the cassava farmers, three categories of the farmers diversifying their incomes as obtained from the study was employed. They include those engaged in the agricultural enterprises (CA strategy), non-agricultural enterprises (CN) and those that combine both the agricultural and non-agricultural enterprises (CAN). The logit regression model showed that age and household size were significant but had a negative relationship with the likelihood of an household being food secure while cassava farm size and every of the income diversification strategies adopted by the farmers had a positive influence on household food security (Table 5). The result showed that engaging in any of income diversification strategies increases the likelihood of the households being food secure as positive relationship between each of the income diversification strategies was observed. Specifically, combination of cassava farming income with other agricultural sources will increase the likelihood of the household being secured by 9.6%. Furthermore adoption of additional income source from non-agricultural related activities will increase household food security by 7.3%. This findings is in tandem to the earlier reports of [12], [19] and [2] that participating in non-farm work is essential in raising income levels among farmers and it has the capability of improving household food security. The last category of income diversification strategy (CAN) is positive and statistically significant at 1%. This positive relationship will increase the likelihood of household being food secured by 17.8%. It can be deduced from the study that engaging in income diversification not only increase income levels among farmers but can also be viewed as a means of reducing various risks associated with farming activities, so by combining cassava farming with other agricultural and non-agricultural enterprise can help guarantee smooth and steady income flows among farmers particularly during the off season and this will consequently improve food security situation among the farming households.

Age of the farmer showed that an increase in the age of the farmer by one year will reduce the likelihood of household food security by 94.8%. This conforms to the earlier result of [14]. This may be due to the fact that the strength and energy to engage in other income generating activities reduces as the farmers grow older there by leading to lower income and thus making them susceptible to being food insecure.

Household size was negatively associated with the likelihood of household being food secure. This means that any additional increment in the present number of household

members without appropriate increase in income may likely reduce the household purchasing powers, put additional pressure on household food resources and may impact negatively on household food security. As seen in this study, an increase by one person in the household will increase the likelihood of household food insecurity by 103%. This however agrees with the findings of [23].

Cassava farm size exhibited a positive relationship with the likelihood of household food security as expected. This implies that farmers that cultivate larger farm size will have more output and can be sold to get more income. This will ultimately increase the farmers' food purchasing capability and thus improve household food security. Specifically, an increase by one unit in the cassava farm size cultivated will increase the likelihood of food security among cassava farming households by 46% in the study area. This corroborates the earlier findings of [12] and [2] who maintained that an increase in the area of land under cultivation promote food security.

Table 5. Logistic regression result of the effect of income diversification on household food security

Variables	Estimated ß values	Standard error	z-value	p>|z|
Age	-0.948***	0.210	4.514	0.000
Sex	0.230	0.588	0.391	0.746
Household size	-1.030***	0.175	5.886	0.000
Cassava farm size	0.460**	0.197	2.335	0.003
Cassava yield	0.409	0.789	0.518	0.682
Income saved	0.001	0.073	0.014	0.994
Cassava and agric (CA)	0.096***	0.022	4.364	0.000
Cassava and non-agric (CN)	0.073***	0.017	4.294	0.000
Cassava, agric and non-agric (CAN)	0.178***	0.051	3.490	0.000
Constant	7.245	2.717	2.667	0.000
Log-likelihood function	-52.880			
χ^2 of Likelihood Ratio test (df = 9)	41.36			
Pro>chi^2	0.000			
Number of observation	120			
Pseudo R^2	0.536			

Source: Computed from Field Survey, 2021.
*** , ** , * implies Significance at p<0.01, p<0.05 and p< 0.10 levels respectively.

CONCLUSIONS

Nearly all of the cassava farmers engaged in income diversification but involvement in agricultural related enterprise constituted the modal group (CA). Income level increases with diversification as farmers that do not diversify at all earn the least income during the growing season.

Food security condition revealed that only 42.5% were food secure while 6.7%, 13.3% and 37.5% were FIWH, FIWMH and FIWSH respectively.

Achieving high food security scenario in the study area is positively associated with increasing the current farm size under cultivation and diversifying into agricultural and non-agricultural enterprises.

Awareness creation on the need for diversification among farmers in the study area would be helpful in improving food security conditions.

Also, technical advice and guidance should be provided to the farmers regarding the combination of enterprises so as to achieve the ultimate aim of improving food security.

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REFERENCES

[1]Adeniyi, O. R., Ojo, O. A., 2013, Food Security Status of Rural Farming Households in Iwo, Ayedire and Ayedaade Local Government Areas of Osun State, South-western Nigeria. African Journal of Food,

Agriculture and Nutrition Development, 13(5): 8209–8223.

[2]Aidoo, R., Mensah, J. O., Tuffour, T., 2013, Determinants of household food security in the Sekyere-Afram plains district of Ghana. European Scientific Journal, 9(21).

[3]Akinsuyi, Y., 2011, Local Government Intervention: Impact in Small-Scale Farming This Day Live. www.thisdaylive.com, Accessed on 4th July, 2012.

[4]Babatunde, R., Salami, M., Adeboje, A., 2016, Poverty among cassava farmers in Oyo State, Nigeria – characteristics and drivers. Journal of Agribusiness and Rural Development, 41(3): 249–254.

[5]Bickel, G., Nord, M., Price, C., Hamilton, W.L., Cook, J.T., 2000, Guide to measuring household food security. Revised. USDA, Food and Nutrition Service. https://fnsprod.azureedge.net/sites/default/files/FSGuide.pdf. Accessed on Mar. 1st, 2019.

[6]Food and Agricultural Organization, FAO, 2015, Voices of the Hungry. 542 pp., http://www.fao.org/economic, Accessed on July1st, 2017.

[7]Food and Agricultural Organization, FAO, 2020, National Policy Responses to Limit the Impact of COVID-19 on Food Markets. Food Policy and Market Developments. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO). http://www.fao.org/giews/foodprices/food-policies/detail/en/c/1270543/Accessed Apr. 12th, 2020.

[8]Federal Office of Statistics (FOS), 1999, Poverty and Agricultural Sector in Nigeria.

[9]Global Hunger Index, GHI, 2021, Nigeria-Global Hunger Index. http://www.globalhungerindex.org Accessed on Oct. 14th, 2021.

[10]Hussayn, J.A., Gulak, D.M., Aboaba, K.O., Keshinro, O.O., 2020, Effects of agricultural commercialization on poverty status of smallholder farming households in Oyo State, Nigeria, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.20(4), 255.265. https://managementjournal.usamv.ro/pdf/vol.20_4/Art32.pdf, Accessed on Oct. 9th, 2022.

[10]Maitra, C., Rao, D .S. P., 2015, Poverty-food security nexus: evidence from a survey of urban slum dwellers in Kolkata. World Development, 72: 308-325.

[11]Minot, N., Epprecht, M., Anh, T. T. T., Trung, L. Q., 2006, Income diversification and poverty in the Northern Uplands of Vietnam. Research report. International Food Policy Research Institute (IFPRI), Washington DC.

[12]Najafi, B., 2003, An overview of current land utilization systems and their contribution to agricultural productivity in Report of the APO Seminar on Impact of Land Utilization System on Agricultural Productivity. Agricultural Productivity Organization (APO), Iran.

[13]National Bureau of Statistics, NBS, 2017, National Bureau of Statistics. Demographic Statistics Bulletin, Federal Republic of Nigeria.

[14]Obayelu, A. E., 2012, Comparative analysis of households' socioeconomic and demographic characteristics and food security status in urban and rural areas of Kwara and Kogi States of North-Central Nigeria. African Journal of Food, Agriculture and Nutrition Development, 12(3):6027-6054.

[15]Obayelu, O.A., Akpan, E.I., Ojo, A.O., 2021, Prevalence and correlates of food insecurity in rural Nigeria: A panel analysis. Econ. Agro-Aliment., 23: 1–25

[16]Olarinde, L.O., Abass, A.B., Abdoulaye, T., Adepoju, A.A., Fanifosi, E.G., Adio, M.O., Adeniyi, O.A., Awoyale, W., 2020, Estimating multidimensional poverty among cassava producers in Nigeria: Patterns and socioeconomic determinants. Sustainability 2020, 12, 5366; doi:10.3390/su12135366

[17]Oluyole, K. A., Taiwo, O., 2016, Socio-economic variables and food security status of cocoa farming households in Ondo State, Nigeria. Asian Journal of Agricultural Extension, Economics and Sociology, 9(1): 1–7.

[18]Onuoha, F. C., Ezirim, G. E., 2010, Climate change and national security: Exploring the conceptual and empirical connections in Nigeria. Journal of Sustainable Development in Africa, 12(4): 255-269.

[19]Owusu, V., Abdulai, A., Abdul-Rahman, S., 2011, Non-farm work and food security among farm households in Northern Ghana. Food Policy, 36(2), 108-118.

[20]OSG, 2010, Odeda Local Government, Nigeria, Area. http://www.ogunstate.gov.ng/eGovernment/index.php?option=com_content&view=article&id=122&Itemid=114 Accessed on Dec, 31 2009.

[21]Perez-Escamilla, R., Segall-Correa, A., 2008, Food insecurity measurement and indicators. Revista de Nutricao, 21:15-26.

[22]Statista, 2021. Nigeria: Prevalence of severe food insecurity, https://www.statista.com/statistics/1135843/prevalence-of-severe-food-insecurity-in-nigeria/, Accessed on Feb. 1st, 2022.

[23]Stewart, H., Harris, J. M., 2005, Obstacles to overcome in promoting dietary variety: the case of vegetables. Applied Economic Perspectives and Policy, 27(1), 21-36.

[24]United State Department of Agriculture 2016. Economics and Agricultural Statistics, 2015, https://www.ers.usda.gov/data-products/food-expenditure-series/ , Accessed on Aug. 20th, 2019.

[25]World Food Programme, 2020, Situation report in Nigeria. https://www.wfp.org/countries/nigeria, Accessed on Aug. 22nd, 2022.